CLAIMS

1.- An apparatus for detecting substances or analytes from the analysis of one or several samples, comprising: a sample homogenizer module capable of acting on the sample contained in a container to produce the homogenization thereof; a sample processing module including a series of independent containers, each one of which is intended for receiving one of the samples to be analyzed; a reaction module including a series of reaction chambers, as many as there are containers included in the sample processing module, each one of which is communicated with one of said containers through a controlled passage conduit and includes a sensor system for detecting substances; a reagent and solution management module storing and dispensing the reagents and solutions necessary in each process step; a data reading module through which the reactions occurring in the reaction chambers are detected and the detected signals are processed; and an overall controller supervising the process and each and every one of the modules of the invention.

2.- An apparatus according to claim 1, characterized in that it further includes a sample distribution module responsible for adding or distributing the samples to the chosen processing module container or containers and for bringing the samples contained in the chosen containers into contact with the homogenizer module.

3.- An apparatus according to claims 1 and 2, characterized in that the sample distribution module includes a hopper or funnel with a fixed position in which the samples to be analyzed are poured.

4.- An apparatus according to claims 1 and 2, characterized in that the sample distribution module is fed by sample injectors stored in multiwell plates.

5.- An apparatus according to the previous claims, characterized in that the sample distribution module includes a rotating drum in which the sample processing module containers are assembled, which drum is capable of always placing a chosen container in communication with the hopper or funnel and, subsequently, with the sample processing module piston.

6.- An apparatus according to claim 5, characterized in that the rotating drum in which the sample processing module containers are assembled is rotational about a vertical shaft.

7.- An apparatus according to claim 5, characterized in that the rotating drum in which the sample processing module containers are assembled is rotational about a horizontal shaft.

8.- An apparatus according to claims 1 and 5, characterized in that the reaction

module chambers are assembled in the rotating drum of the sample distribution module.

9.- An apparatus according to claims 1 and 6, characterized in that the sample processing module further comprises means for closing the container housing the samples to be analyzed during the processing of said sample, which means consist of a piston assembled in a rack located above the rotating drum and under which the different containers can be placed by means of the rotation of said drum, the rack being movable in the longitudinal direction between a top open position and another bottom closed position of the container placed immediately underneath.

10.- An apparatus according to claims 1 and 7, characterized in that the sample processing module further comprises means for closing the container housing the samples to be analyzed during the processing of said samples, which means consist of a piston assembled on a rack placed on one side of the rotating drum and opposite which the different containers may be arranged, placed on the other side of the drum as a result of the rotation of said drum, the rack being moveable between an open position and a closed position.

11.- An apparatus according to claim 1, characterized in that each one of the sample processing module containers further comprises means for the closing thereof, which means consist of a piston or valve assembled in each container and actuated by the movement of the homogenization module moving rack.

12.- An apparatus according to claim 1, characterized in that each sample processing module container includes one or more main homogenization chambers and one or more independent secondary chambers intended for containing the reagents, intercommunicated with the main chamber, said main chamber being open so as to receive the sample to be analyzed and the closing means, and having a bottom port with a filter and a flow valve, through which the homogenized sample is injected into the reaction module.

13.- An apparatus according to claims 9 and 12, characterized in that the wall of the main chamber has a venting port located above the intercommunication ports with the secondary chambers, determining the moment of the hermetic sealing of said chamber by the piston when said port is surpassed by a gasket of the piston, said piston being movable inside the main chamber from the hermetic sealing position so as to cause the pressure inside said chamber to increase.

14.- An apparatus according to claim 13, characterized in that the sample introduction into the main chamber is carried out through the venting port.

15.- An apparatus according to claim 12, characterized in that the secondary chambers are closed at the top and bottom parts by means of caps through which cannulas belonging to the reagent management module for injecting reagents or solutions, or which carry pressure or temperature sensors, or sensors for other physicochemical parameters, can be introduced.

16.- An apparatus according to claim 12, characterized in that the flow valve located between the main chamber of each sample processing module container and the reaction module chamber consists of a non-return value, the closing of which occurs when an overpressure is created in the reaction module chamber with respect to the sample processing module main chamber.

17.- An apparatus according to claim 9, characterized in that the sample processing module rack is assembled on the sample distribution module movement shaft, on one of the sides of said module, without rotational ability but with the ability to slide thereon between end positions determined by a sensor.

19.- An apparatus according to claims 1 and 9, characterized in that the longitudinally moving rack includes the sample homogenization means, which consist of a device with thermal or mechanical action or a wave generator capable of acting on the samples.

20.- An apparatus according to claims 9 or 10, characterized in that said piston has a tubular structure and the sample homogenization device acts through it.

21.- An apparatus according to claims 1 and 16, characterized in that the reaction module comprises for each sample processing module container a body defining an internal reaction chamber having an inlet connected to the main chamber of said container through the non-return valve, an inlet connected to the secondary chamber of said container through which a washing solution is injected, and a solution outlet to a waste deposit; one of the walls of said chamber carrying the sensor system responsible for detecting the substances present in the homogenized solution or suspension injected in the chamber.

22.- An apparatus according to claim 1, characterized in that the reagent and solution management module comprises at least one motorized syringe responsible for storing and dispensing fluids which is accompanied by a linear actuator actuating the syringe plunger rod, a position sensor to obtain the position of the plunger, a non-return valve and an injection cannula fixed to the sample processing module moving frame.

23.- An apparatus according to claim 22, characterized in that it comprises a series of reagent and solution deposits, there being the same number of deposits as

different reagents and solutions are needed, and at least one pumping device capable of aspirating the fluids from the different deposits and dispensing them into the homogenization or reaction chamber.

24.- An apparatus according to claim 1, characterized in that the reaction module is made up of a receptacle to house a biosensor, which has at least one inlet port for the sample coming from the sample processing module container, at least one inlet port for additional liquid solutions, and at least one outlet port for the different solutions and pipes or conduits that are necessary.

25.- An apparatus according to claim 24, characterized in that the inlet and outlet ports are connected by a conduit where a pumping system is arranged which allows recirculating the sample on the biosensor.

26.- An apparatus according to claim 24, characterized in that the receptacle in which the biosensor is located includes a system of stirring or moving the liquid sample so as to improve the working of said biosensor.

27.- An apparatus according to claim 24, characterized in that said biosensor is formed by detecting substances immobilized on a solid support in the form of a microarray or biochip, distributed in flow channels or chambers.

28.- An apparatus according to claim 1, characterized in that the data reading module comprises a reaction detector including a light source for energizing the biosensor and a suitable radiation detection system.

29.- An apparatus according to claims 1 and 28, characterized in that said light source is monochromatic and the detecting system is a CCD camera coupled to filters to detect only the appropriate radiation.

30.- An apparatus according to claims 28 and 29, characterized in that the monochromatic light is guided by means of a waveguide in which the biosensor is located, which biosensor is energized as a result of the evanescent modes forming on the outer surface of said guide.

31.- An apparatus according to claim 1, characterized in that it comprises a cage-shaped structure assembled in which there is a central vertical column, which defines the rotation shaft of the sample distribution module rotating drum, and along which column the sample processing module rack can slide, the sample acquisition module hopper or funnel, the reagent management module and the data reading module being assembled in said cage-shaped structure.

32.- An apparatus according to claims 1 and 7, characterized in that it comprises a cage-shaped structure assembled in which, according to a horizontal

shaft, is the sample distribution module rotating drum and parallel to said shaft, the guides through which the sample processing module rack slides, the sample acquisition module hopper or funnel, the reagent management module, the data reading module and the communication and control modules also being assembled in said cage-shaped structure.

33.- A method for detecting substances or analytes from the analysis of one or more samples, characterized in that it comprises the steps of: a) mixing said sample with a suitable liquid buffer; b) homogenizing with a homogenizing system; c) adding reagents to modify said sample; d) filtering the sample; e) injecting said sample in a reaction chamber; f) allowing the sample to react with a biosensor; g) washing the non-reacted sample excess; and h) detecting the sample retained in the biosensor.

34.- A method according to claim 33, characterized in that the suitable liquid buffer is a saline solution.

35.- A method according to claim 33, wherein the liquid buffer has a sample marker compound.

36.- A method according to claim 33, characterized in that the marker compound excess is blocked with a blocker compound.

37.- A method according to claims 1 and 33, characterized in that the biosensor consists of at least one substance capable of specifically binding to another substance.

38.- A method according to claim 37, characterized in that the substance or substances capable of specifically binding to another or to other substances are chosen from the group formed by: a) a substance of an amino acid nature; b) a substance of a proteinaceous nature; c) a substance of a nucleotide nature; d) a nucleic acid; e) a peptide-nucleic acid (PNA); f) a substance of a lipid nature; g) a substance of a saccharide nature; h) a substance that is the combination of at least two of the previous ones; j) a live whole cell; j) a whole cell in the form of a spore; k) a cell extract or lysate; l) a tissue formed by cells; m) a whole virus or any of its components; n) synthetic polymers; and o) molecularly imprinted polymers (MIP).

39.- A method according to claim 38, characterized in that the proteins capable of specifically binding to other substances are monoclonal or polyclonal antibodies.

40. A method according to the claims 33 and 35 , characterized in that said sample modifying compounds are chosen from a chemical reagent capable of binding to any of the analytes present in the sample, or one or more substances from among those mentioned in claims 38 and 39, or a combination of both.

41. A method according to claim 33 characterized in that the signal of the

sample retained in the biosensor is amplified by a cocktail or a mixture containing one or more substances of those mentioned in claims 38 and 39.

42. A method according to claims 33 and 41, characterized in that said cocktail consists of one or more antibodies marked with a fluorescent substance, a metallic compound or an enzyme.

43. A method according to claims 33 and 41, characterized in that said cocktail consists of one or more PNA or nucleic acid fragments marked with a fluorescent substance, a metallic compound or an enzyme.